[S18.001] MRI Analogs of Alzheimer's and Cerebrovascular Neuropathology

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OBJECTIVE: To evaluate independent effects of Alzheimer's and cerebrovascular neuropathology on cognitive status and decline using volumetric MRI estimates of neuropathology.
BACKGROUND: Alzheimer's disease (AD) and cerebrovascular disease (CVD) are common pathologies in older persons that frequently co-occur and vary in extent of pathology and distribution throughout the brain. AD is a major source of cognitive decline but is difficult to measure in vivo. CVD is easier to measure in vivo using MRI, but it is difficult to know its impact on cognition without knowing if AD is present. This study used volumetric measures of hippocampal volume (HC), cortical gray matter volume (cGM), subcortical lacune volume (LV), and white matter hyperintensity volume (WMH) to create MRI analog measures of AD and CVD neuropathology and then estimated AD and CVD effects on cognitive status and decline.
DESIGN/METHODS: 45 individuals with antemortem MRI and postmortem neuropathological evaluation of the brain were used to examine covariance of MRI variables (cGM, HV, LV, WMH) and neuropathology ratings (neurofibrillary tangle distribution, frequency of neuritic plaques, and extent of cerebrovascular brain injury). Dimensions identified in this sample using multivariate analysis were then estimated using only MRI variables. MRI estimates of these dimensions were used to predict baseline status and decline of memory and executive function in a sample (n=183) who had received MRI and longitudinal neuropsychological testing.
RESULTS: Two clear dimensions corresponding to AD and CVD neuropathology were identified in the neuropathology sample and were highly stable across bootstrap replications. Multivariate methods were used to create MRI based estimates that were highly correlated with these dimensions. One dimension (AD MRI) was defined by HV and cGM (both negative weightings). The second (CVD MRI) was defined by LV, WMH, and cGM (negative weighting). Jackknife cross-validation showed a double dissociation of AD MRI and CVD MRI with measures of AD and CVD neuropathology. AD MRI but not CVD MRI was strongly associated with baseline memory and memory decline, whereas AD MRI and CVD MRI were significant and relatively equal contributors to baseline and change in executive function.
CONCLUSIONS: MRI analogs of AD and CVD neuropathology showed specific relationships to AD and CVD neuropathology and have important potential application for examining independent contributions of these pathologies to cognitive impairment and cognitive decline. Results showed that memory was accounted for by AD, but executive function was related to both AD and CVD.
Supported By: National Institute on Aging (AG12435, AG10129)
Category - Aging and Dementia
SubCategory - Imaging